



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/552,971	10/18/2006	William R. Tonti	BUR920020076US2	6772

32074 7590 04/21/2010
INTERNATIONAL BUSINESS MACHINES CORPORATION
DEPT. 18G
BLDG. 321-482
2070 ROUTE 52
HOPEWELL JUNCTION, NY 12533

EXAMINER

SOFOCLEOUS, ALEXANDER

ART UNIT	PAPER NUMBER
----------	--------------

2824

NOTIFICATION DATE	DELIVERY MODE
-------------------	---------------

04/21/2010

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

EFIPLAW@US.IBM.COM

Office Action Summary	Application No. 10/552,971	Applicant(s) TONTI ET AL.	
	Examiner ALEXANDER SOFOCLEOUS	Art Unit 2824	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Election filed on March 18, 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5 and 7-24 is/are pending in the application.
- 4a) Of the above claim(s) 15-24 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 7-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 October 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>See Continuation Sheet.</u> | 6) <input type="checkbox"/> Other: _____ |

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :5/13/05, 10/11/05, 2/16/07, 11/20/07, 12/08/09.

DETAILED ACTION

1. This action is responsive to the following communication: the Election filed March 18, 2010, the Information Disclosure Statement filed May 13, 2005, the Information Disclosure Statement filed October 11, 2005, the Information Disclosure Statement filed February 16, 2007, the Information Disclosure Statement filed November 20, 2007, and the Information Disclosure Statement filed December 8, 2009.
2. Claims 1-5 and 7-24 are pending. Claims 15-24 are withdrawn from further consideration. Claim 6 was previously cancelled. Claim 1 was previously amended. Claim 1 is independent.

Election/Restrictions

3. Applicant's election of Group I (claims 1-5 and 7-14)¹ in the reply filed on March 18, 2010 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claims 15-24 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to nonelected inventions, there being no allowable generic or linking claim.

Information Disclosure Statement

¹ It is noted that claim 6 was cancelled in the preliminary amendment filed concurrently with the application. While the restriction as well and the election include claim 6, it is appreciated that it was intended for Group I to include 1-5 and 7-14 (excluding cancelled claim 6) and that it was intended for election of same. Also, see claim objection infra 8.

Art Unit: 2824

4. Acknowledgment is made of applicant's Information Disclosure Statements (IDS) filed on May 13, 2005, October 11, 2005, February 16, 2007, November 20, 2007, and December 8, 2009. These IDS have been considered.

It is noted that on the IDS filed May 13, 2005 and October 11, 2005, the cited NPL (Kothandaraman et al.) has been struck-through so as to promote clarity at time of issue, should this application mature into a Patent. This NPL was additionally cited in IDS filed February 16, 2007 and it has been considered.²

Drawings

5. Figures 2, 3, 4a, 4b, 4c, 5a, and 5b appear to be photographs (?) or scanned images (?) and may not be as clear as was intended. It is noted that the Figures found in the Provisional application (60/462,568) are much clearer.

It is suggested to review the quality of these present Figures as they appear on Public Pair (or by in Patent Application Publication 2007/0242548). For example, Figure 5b may benefit from an alternate presentation (perhaps a computer-drawn model may be more appealing? or perhaps resubmitting clean versions of these Figures from provisional application). Applicant is invited to make any necessary adjustments to presentation of these Figures. One potential quick computer-drawn presentation for Fig. 5a is provided on the next page of

² There is no substantial difference among the three submissions of this one reference. The purpose of striking through two of these submission is to promote clarity during processing as well as prevent confusion regarding duplicative references at time of publication. The choice to strike-through the two prior submissions, as opposed to striking-through just any two, was simply because the citation listed on the IDS filed February 16, 2007 (the later filed) appears more complete since it includes pertinent page numbers and thus will less likely experience delays in processing. It is noted though, that all three submissions are on record in the image file wrapper.

Art Unit: 2824

this Office Action. Alternate suggested corrections are invited.

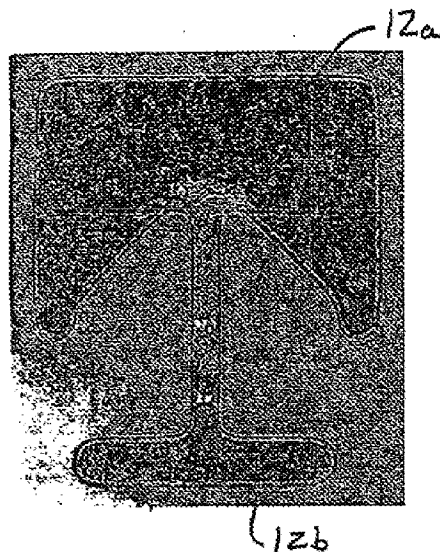


Fig 5 a Old Figure 5a

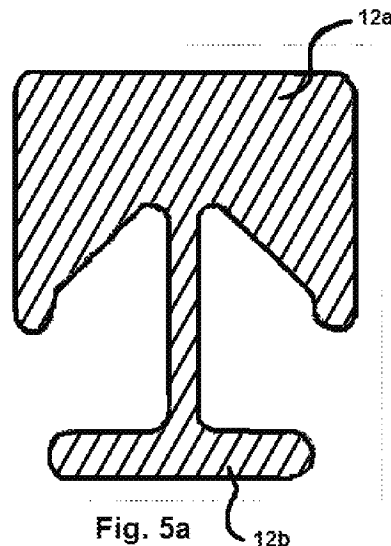


Fig. 5a
Examiner Proposed Correction

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner,

Art Unit: 2824

the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

6. The abstract of the disclosure is objected to because of the following minor informalities: delete "(Fig. 1)" and text in the footer. These suggestions are made to promote clarity for publication at time of issue, should this application mature into a Patent.

In the **Abstract**, line 24, it is suggested to delete "(Fig. 1)."

In the **Abstract** (lower-left corner of footer region), it is suggested to delete "BUR920020076US2."

Correction is required.

7. The disclosure is objected to because of the following informalities:
change "<<" to --less--.

In the **Specification**, page 7, line 27, change "<<" to --less--.

In the **Specification**, page 8, line 6, change "<<" to --less--.

Appropriate correction is required.

Claim Objections

8. Claim 6 is objected to for the following minor informalities: claim text in a cancelled claim. The presented claim text in this cancelled claim appears to be just a minor oversight, but as a helpful reminder, when cancelling claims, the claim text should not be presented. See MPEP 714, esp., 37 CFR 1.121(c)(4)(i).

Art Unit: 2824

It is suggested to change claim 6 to --6. (Cancelled)--.

Appropriate correction is required.

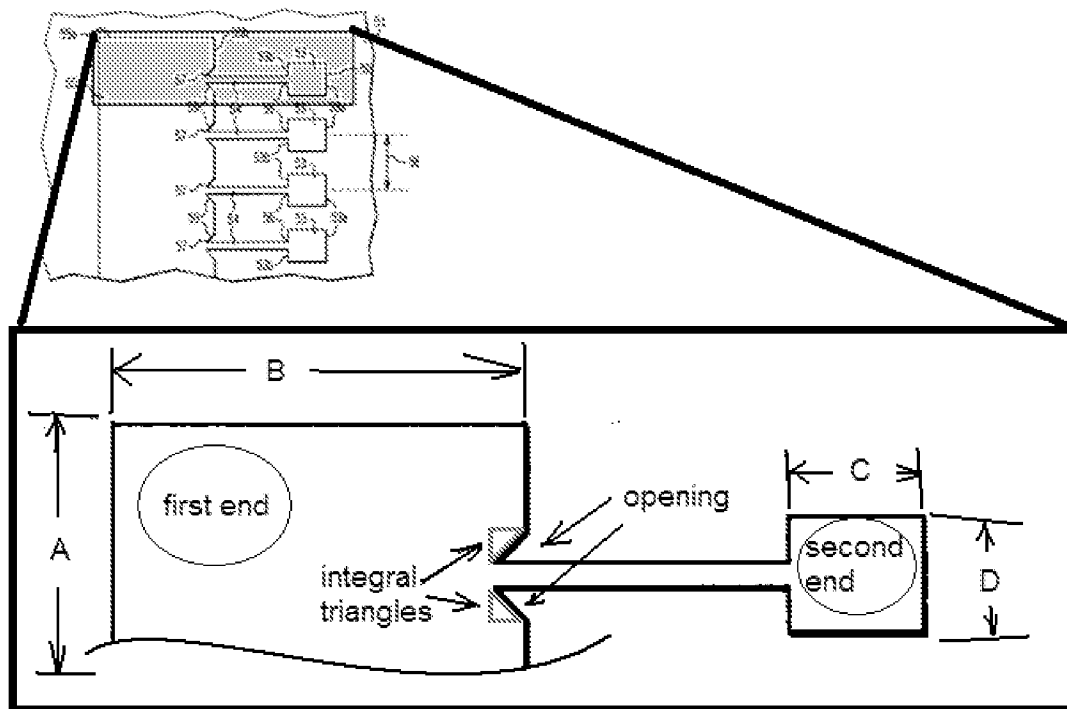
Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. **Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Narayan et al. (U.S. Patent 6,008,523; cited on IDS filed 12/8/09) in view of Marshall et al. (U.S. Patent 6,642,601).**

EXAMINER MARK-UP
NARAYAN et al. FIG. 3



Regarding independent claim 1, Narayan et al. teach a programmable device (see Fig. 3), comprising:

- a substrate (Fig. 3: 51; see e.g., Fig. 8: 41);
- an insulator (see e.g., Fig. 8: 91) on said substrate (Fig. 8: 41);
- a metallic material (see e.g., Fig. 8: 43) on said insulator (Fig. 8: 91), said metallic material being physically migratable responsive to an electrical current flowable through said metallic material (see column 12, lines 23-28; while the specific term “migratable” is not used in this reference, when the fuse is blown in response to an appropriate current, the fuse material will necessarily move);
- wherein said first end (see Examiner Mark-up Fig. 3: first end) of the metallic material is substantially wider (see Examiner Mark-up Fig 3: either of

Art Unit: 2824

widths A or B) than said second end (see Examiner Mark-up Fig. 3: second end with respect to either of widths C or D) and comprising a plurality of integral triangular-shaped portions (see Examiner Mark-up Fig. 3: integral triangles; while specific term "integral triangles" is not used in this reference, the term is presently considered met by triangular shapes included in, *or integrated* into, the fuse structure, which the mark -up shows) forming openings (see Examiner Mark-up Fig. 3: opening) which face generally toward said second end (see Examiner Mark-up Fig. 3: second end).

Narayan et al. are silent with respect to the following specific provisions: an *elongated semiconductor material* on said insulator, said elongated semiconductor material having first and second ends, and an upper surface, said first end [of the semiconductor material] being substantially wider than said second end [of the semiconductor material] and comprising a plurality of integral triangular-shaped portions forming openings which face generally toward said second end [of the semiconductor material], the metallic material *being on said upper surface* [of the semiconductor material], and current additionally being flowable through said semiconductor material. In short, Narayan et al. are silent with respect to an elongated semiconductor material, having a substantially similar shape to the metallic material, being between the insulator and the metallic material.

Marshall et al. teach a fuse that utilizes a polysilicon layer (semiconductor layer) , which is doped and conductive (see column 4, lines 66 and 67 with respect to column 3, lines 52-55 and column 6, lines 25-29), as a base having

Art Unit: 2824

substantially the same shape as the fuse, for the purpose of minimizing the possibility of the silicide (the fuse material) from lifting off of the underlying substrate (see Fig. 5B with respect to column 6, lines 39-47).

It would have been obvious to one of ordinary skill in the art at the time of the invention to apply the teachings of Marshall et al. to the teachings of Narayan et al. such that Narayan et al. fuse is augmented to further include a semiconductor layer directly underneath the fuse material, as taught by Marshall et al., for the purpose of minimizing the possibility of the silicide from lifting off of the underlying substrate (column 6, lines 39-47).

Regarding dependent claim 2, Narayan et al. and Marshall et al., as combined, further teach an energy source (while an “energy source” is not explicitly illustrated in the figures, an “energy source” must exist in these teachings in order to apply the *current* or *voltage* to blow the taught fuse; note specifically, Narayan et al. column 12, lines 23-28 and Marshall et al. column 6, lines 58-60) connected to said elongated semiconductor material (Marshall et al. Fig. 5B: 210), for causing an electrical current to flow through said elongated semiconductor material (Marshall et al. Fig. 5B: 210) and through said metallic material (see e.g., Narayan et al. Fig. 8: 43; see, also, Marshall et al. Fig. 5B: 212), and for causing said metallic material (see e.g., Narayan et al. Fig. 8: 43; see, also, Marshall et al. Fig. 5B: 212) to migrate (see Narayan et al. column 12, lines 23-28; while the specific term “migratable” is not used in this reference, when the fuse is blown in response to an appropriate current, the fuse material will necessarily move) along said upper surface (Marshall et al. Fig. 5B: top

Art Unit: 2824

surface of 210).

Regarding dependent claim 3, Narayan et al. and Marshall et al., as combined, said elongated semiconductor material (e.g., Marshall et al. Fig. 5B: 210) comprises a doped polysilicon (see Marshall et al. column 6, lines 25-29 with respect to column 4, lines 66 and 67 and column 3, lines 52-55).

Regarding dependent claim 4, Narayan et al. and Marshall et al., as combined, further teach said metallic material (see e.g., Narayan et al. Fig. 8: 43; see, also, Marshall et al. Fig. 5B: 212) comprises a metallic silicide (Narayan et al. column 8, line 4; Marshall et al. column 6, line 48 with respect to e.g., column 4, lines 29, 46, and 47).

Regarding dependent claim 5, Narayan et al. and Marshall et al., as combined, further teach said metallic material (see e.g., Narayan et al. Fig. 8: 43) is a metallic silicide selected from the group consisting of WSi_2 , NiSi_2 and CoSi_2 (Narayan et al. column 8, line 4).

Regarding dependent claim 7, Narayan et al. and Marshall et al., as combined, further teach said second end (see Examiner Mark-up Fig. 3: second end) comprises an oblong-shaped portion (see Examiner Mark-up Fig. 3: dimension C appears greater than dimension D).

Regarding dependent claim 8, Narayan et al. and Marshall et al., as combined, further teach said metallic material (see e.g., Narayan et al. Fig. 8: 43; see, also, Marshall et al. Fig. 5B: 212) is disposed on the entire upper surface (see Marshall et al. Fig. 5A, noting that none of 210, as depicted in Fig. 5B, is exposed) of said elongated semiconductor material (see Marshall et al. Fig. 5B

Art Unit: 2824

with respect to column 6, lines 39-47).

Regarding dependent claim 9, Narayan et al. and Marshall et al., as combined, further teach said metallic material (see e.g., Narayan et al. Fig. 8: 43; see, also, Marshall et al. Fig. 5B: 212) is a semiconductor alloy (Narayan et al. column 8, lines 3-5).

Regarding dependent claim 10, Narayan et al. and Marshall et al., as combined, further teach said elongated semiconductor material (Marshall et al. Fig. 5B: 210) is N⁺ polysilicon (see Marshall et al., e.g., column 4, lines 66 and 67) and said metallic material (see e.g., Narayan et al. Fig. 8: 43; see, also, Marshall et al. Fig. 5B: 212) is WSi₂ (see Narayan et al. column 8, line 4).

Regarding dependent claim 11, Narayan et al. and Marshall et al., as combined, further teach said elongated semiconductor material (Marshall et al. Fig. 5B: 210) includes a central portion (Narayan Fig. 3: 54; see Marshall et al. Fig. 5A: 203) connecting said first end (Examiner Mark-up Fig. 3: second end) to said second end (see Examiner Mark-up Fig. 3: second end).

Regarding dependent claim 12, Narayan et al. and Marshall et al., as combined, further teach said central portion (Narayan Fig. 3: 54; see Marshall et al. Fig. 5A: 203) has a maximum substantially uniform width of less than approximately one micron (see Marshall et al. column 6, lines 54 and 55; also see Narayan et al. column 12, line 13).

Regarding dependent claim 13, Narayan et al. and Marshall et al., as combined, further teach said central portion typically has a length of about 4 microns (Narayan et al. column 12, lines 4 and 5).

Narayan et al. and Marshall et al. are both silent with respect to the length being less than about two microns. However, in the prior art discussion, Narayan et al. explain that the fuse length is a variable that is directly and proportionally related to the fuse resistance (see Narayan et al. column 2, lines 42-52); doubling the length doubles the resistance and, which follows without stating, halving the length halves the resistance.

In this regard, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the fuse taught by Narayan et al. such that the fuse length, which is a variable proportional to resistance, is less than two microns for the purposes of reducing the resistance. Given the difference between the prior art and the claimed invention lies only in the length of the fuse which is an appreciable variable that effectively results direct change on resistance, absent *criticality*, which may be shown by evidence of unexpected results, for limiting the fuse length to under two microns, this claim is prima facie obvious over the applied prior art. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Regarding dependent claim 14, Narayan et al. and Marshall et al., as combined, further teach said central portion (Narayan Fig. 3: 54; see Marshall et al. Fig. 5A: 203) and said second end (see Examiner Mark-up Fig. 3: second end) form a T-shaped member (the center portion and the second end, as taught by the combination, forms a substantial T-shape).

CONCLUSION

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Sur, Jr. et al. (U.S. Patent 5,854,510), Bohr et al. (U.S. Patent 6,337,507), and Booth, Jr., et al. (U.S. Patent 7,417,300).

Sur, Jr. et al. teach a low power programmable fuse including a field oxide strip, a polysilicon strip directly on the field oxide strip, and a silicide layer directly on the polysilicon strip.

Bohr et al. teach a fuse including an oxide layer, a polysilicon layer directly on the oxide layer, and a silicide layer directly on the polysilicon layer.

Booth, Jr., et al., filed after the instant application's earliest effective filing date, teach a related eFuse.

When responding to this office action, applicants are advised to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist the examiner in locating appropriate paragraphs.

A shortened statutory period for response to this action is set to expire three months and zero days from the date of this letter. Failure to respond within the period for response will cause this application to become abandoned (see MPEP 710.02(b)).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander Sofocleous whose telephone number is 571-272-0635. The examiner can normally be reached on 7:00am - 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the

Art Unit: 2824

examiner's supervisor, Richard Elms can be reached on 571-272-1869. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/ALEXANDER SOFOCLEOUS/
Examiner, Art Unit 2824